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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,581	12/29/2003	Robert E. Higashi	H0005015-0760(1100.123710	8573

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EXAMINER	
ECHELMEYER, ALIX ELIZABETH	
ART UNIT	**PAPER NUMBER**
1795	

MAIL DATE	DELIVERY MODE
10/28/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/750,581	HIGASHI ET AL.	
	Examiner	Art Unit	
	Alix Elizabeth Echelmeyer	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *29-34,36,37,39-45,47-56 and 58-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29-34,36,37,39-45,47-56 and 58-70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Comment [S1]: Enablement rejection and art rejections cannot be applied at the same time. If the claims are fully not enabled, then there would not be any art. Also, the office action appears to be incomplete. There is no response to arguments section or conclusion section.

1. This Office Action is in response to the amendment filed July 15, 2008. Claims 29, 45, 47, 54, 59 and 63 have been amended. Claim 46 is cancelled. Claims 67-70 are added. Claims 29-34, 36, 37, 39-45, 47-56 and 58-70 are pending and are rejected finally for the reasons given below.

Claim Interpretation

2. Claims 29-34, 36, 37, 39-45, 47-56 and 58-66 are directed to electrodes for a fuel cell, wherein the electrodes have apertures, and a proton exchange membrane is sandwiched between the apertures. The instant specification teaches that the catalyst layers are formed on the membrane, and not on the so-called electrodes (Claim 2, [0029], [0031], [0039], etc. of the instant specification, see US Pre-Grant Publication 2005/0142410). For the purposes of examination, the electrodes as claimed will be interpreted to be current collectors, since the catalyst layer is already contained in the membrane.

3. Claims 29-34, 36, 37, 38-45, 54-56 and 58-66 are drawn to method claims. The claims are directed, for example, to “forming a first aperture …” and “providing” various components. Since an assembled fuel cell having the structural requirements of the method claims would inherently have been formed by “providing” those components, a fuel cell having the structure required by the method claims is interpreted to having been formed by that method.

4. The some claims contain limitations to at least a portion of certain surfaces of the electrode layers being conductive. If the entire layer is conductive, as in claims 42 and 43, then at least a portion of the surface is conductive.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 29-34, 35-37, 39-45, 47-56 and 58-70 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

One having ordinary skill in the art would not be enabled to create the fuel cells of the claimed invention having the membrane exposed by the apertures, where the parts of the membrane that are exposed are not covered by the catalyst, but where the catalyst covers all other parts of the membrane (see Figure 4C of the instant invention). First, it is unclear how the reactants would split into hydrogen and oxygen ions, respectively, if the reactants provided through the apertures are not reacted at the catalyst. Second, it appears that the cells would short when the electrical connects are made without a load, as depicted in Figure 7.

MPEP 2164.01(a) Undue Experimentation Factors

> There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to:
> (A) The breadth of the claims;
> (B) The nature of the invention;
> (C) The state of the prior art;
> (D) The level of one of ordinary skill;
> (E) The level of predictability in the art;
> (F) The amount of direction provided by the inventor;
> (G) The existence of working examples; and
> (H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.
> *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988)

The disclosed invention fails to satisfy the enablement requirement based on several factors from the above list. Only the relevant factors will be addressed.

(B) The nature of the invention shows that the invention is not enabled since the invention causes the fuel cells to short circuit by forming an electical connection without a load.

(C) The state of the prior art supports the determination that the disclosure does not satisfy the enablement requirement since it is known within the art that a catalyst is needed to split the reactants into hydrogen and oxygen ions to perform the electrochemical reaction of a fuel cell.

(D) The level of one of ordinary skill supports the determination that the disclosure does not satisfy the enablement requirement. Based on the disclosure, one having ordinary skill in the art would be unable to produce a working fuel cell, since the catalyst would not be present in the apertures where the reactants are provided and the lack of a load would result in the shorting of the fuel cell.

Thus, based on the above analysis, one of ordinary skill in the art at the time the invention was made would not have known how to make an operative fuel cell based on Applicants' disclosure without undue experimentation.

7. For the purposes of examination, the membrane of the instant claims will be interpreted as having the catalyst layers already applied.

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Claim Rejections - 35 USC § 102

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8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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9. Claims 29, 30, 33, 34, 36-45, 47, 48, 54, 56 and 60-66 are rejected under 35 U.S.C. 102(b) as being anticipated by Pratt et al. (US Patent 6,127,058).

With regard to claim 29, Pratt et al. teach a planar fuel cell having a membrane electrode assembly sandwiched between two current collectors (abstract). Pratt et al. further teach that the assembly is held together by an adhesive (column 5 lines 9-13). In Figure 4, it is seen that the membrane electrode assembly contains electrodes that are separated by an aperture, if one considers that the electrodes were all one sheet and then cut apart to form individual electrodes. The current collecting assembly (44, 45, 46) covers the areas where the electrodes do not cover the membrane, or aperture.

It is clear from Figure 4 that, when the parts are placed together in an assembly, the apertures would be aligned. One having ordinary skill in the art would recognize that, since the size and shape of the conductors is the same and since the locations of the apertures are the same, the apertures would line up when the assembly is made.

As for claims 30, 48 and 62, Pratt et al. teach that the membrane is coated on both sides with a catalyst (column 5 lines 6-8).

Regarding claims 33-35, 42, 43, 54 and 56 in one embodiment Pratt et al. teach metal current collectors on a plastic film (column 5 lines 13-29). The current collector is inherently conductive since it must conduct electricity in order for the fuel cell to function. Further, when the plastic film is considered as a frame and the metal current collectors are considered the electrodes, than the entire metal current collector, not including the film, is conductive on both surfaces. This means that both surfaces are conductive and are in electrical contact with each other. With further regard to claim 47, the current conductor also serves as a through contact, since the top and bottom surfaces are both conductive and are electrically connected.

Regarding claim 37, the current collectors are conductive layers provided on the plastic film. In this case, the electrode is the plastic film, which is nonconductive, and the metal current collectors are conductive, so the current collecting layer, or “electrode layer” of the instant claims, is both conductive, because of the metal current collectors, and nonconductive, because of the plastic film.

As for claims 36, 47, 64 and 65, the adhesive layer discussed above must be conductive in order for the fuel cell to produce electricity, so it will be considered as a conductive layer. The layer would be provided after the apertures were formed in the current collecting layer (column 5 lines 9-13).

As for claim 39, the adhesive layer covers part of the aperture surfaces, as just discussed and as seen in Figure 4.

Regarding claims 40, 41, 44 and 45, the conductive layer would inherently extend through the apertures since it must conduct electricity out of the fuel cell because the entire layer is conductive and includes apertures.

As for claim 61, since the layers of Pratt et al. are joined it would follow that they were passed through a joining unit.

As for claim 63, a plurality of electrical contacts is seen in Fig. 4 (46), since current collector is an electrical contact and there are a plurality of extensions.

With regard to claim 66, the fuel cell system of Pratt et al. would inherently have a fuel reservoir to provide fuel to the anode, which is connected to the proton exchange membrane, since one of ordinary skill in the art would recognize that such a reservoir would be necessary in order to provide fuel to the fuel cell and generate electricity.

Claim Rejections - 35 USC § 103

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10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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11. Claims 58-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt et al. in view of Diekmann et al. (US 6,268,076).

The teachings of Pratt et al. as discussed above are incorporated herein.

Pratt et al. teach the fuel cell having apertures as discussed above, but fail to teach a conductive feed-through through the first material. Pratt et al. do teach the first material (44, 45 in Figure 4) and electrical contacts (46), but the contacts are only on one side of the non-conduction portion of the current collector.

Diekmann et al. teach a current collector having connections that are enveloped in conductive material (column 6 lines 10-25).

It would have been obvious to provide current collecting material on all sides of the electrode tabs of Pratt et al. such as taught by Diekmann et al. since it would allow for electrical connections to be made form any side of the tab, not just the side that has connective material as in Pratt et al.

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12. Claim 55 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt et al. in view of Simonton (US 4,906,536).

The teachings of Pratt et al. as discussed above are incorporated herein.

Pratt et al. fail to teach dicing the array after it is formed.

Simonton teaches an array that is formed continually and cut to form the desired size of array (column 12-25).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to cut the array of Pratt et al. into the desired size such as taught by Simonton since it would allow for mass production of arrays even if large arrays were not needed, making the manufacturing process more efficient.

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13. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt et al. in view of Stanley et al. (US Pre-Grant Publication 2004/0053100).

The teachings of Pratt et al. as discussed above are incorporated herein.

Pratt et al. teach a method for providing a membrane electrode assembly but fail to teach the instantly claimed membrane and catalyst materials.

Stanley et al. teach a membrane made of polytetrafluroethylene and a perfluorosulfonic acid ([0034]). The catalyst of Stanley et al. may be platinum supported on carbon black ([0066]).

Stanley et al. teach that it is conventional to use a solid polymer electrolyte, such as one made of polytetrafluroethylene and a perfluorosulfonic acid, since it is dimensionally stable and inert ([0007], [0034]).

Stanley et al. further teach that platinum supported on carbon black is a conventionally recognized catalyst for enhancing reaction rate ([0007], [0066]).

It would have been desirable to form the membrane and catalyst of Pratt et al. with the materials taught by Stanley et al. since they would form a fuel cell that was dimensionally stable and inert, and enhanced the reaction.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the membrane and catalyst of Pratt et al. with

the materials taught by Stanley et al. since they would form a fuel cell that was dimensionally stable and inert, and enhanced the reaction.

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14 Claims 49-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pratt et al. in view of Badding et al. (US Pre-Grant Publication 2002/0102450).

The teachings of Pratt et al. as discussed above are incorporated herein.

Pratt et al. teach a fuel cell assembly that is very thin (column 5 line 39).

Pratt et al. fail to teach the specifically claimed dimensions.

Badding et al. teach a fuel cell apparatus having thicknesses for various components of 0.1 to 50 microns, which is desired in order to provide a current path while overcoming the resistivity of various materials ([0052]).

It would have been desirable to create parts of the fuel cell of Pratt et al. as small as possible, such as in the dimensions of Badding et al., in order to create a fuel cell that was very thin but still functioned to overcome the resistivity of the materials used.

It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. MPEP 2144.05 (IIB). For example, in each claim the thickness is considered. Since the thickness is a result effective variable as taught by Badding et al., yet the thickness is also desirably minimized, then it would be obvious over Pratt et al. in view of Badding et al. to find the optimum thickness value.

Response to Arguments

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15. Applicant's arguments filed July 25, 2008 have been fully considered but they are not persuasive.

As for the 112 first paragraph rejection, Applicant alleges that a catalyst is not necessary for the operation of a fuel cell. The examiner very strongly disagrees with this argument. Applicant can surely recognize, as would one of ordinary skill in the art, that hydrogen molecules do not spontaneously split as hydrogen molecules split in the presence of a catalyst. The thermodynamic barrier that the molecules need to overcome is too great for the splitting to occur at a rate anywhere near fast enough to produce electricity for use in any conceivable amount. Additionally, even if the do molecules split on rare occasions, the chance that H+ ions created would travel across the membrane would be highly improbable, since at the same time the hydrogen molecule randomly split, an oxygen molecule would also have to split.

One of ordinary skill in the art knows that the activation energy for the splitting of a hydrogen molecule is so high that it is extremely rare for hydrogen molecules to split without the presence of a catalyst.

On page 11, Applicant provides the extreme understatement that "the reaction would proceed without a catalyst, albeit more slowly." Yes, there is a chance that a few electrons would provide a negligible amount of electricity through the "slow" reaction, but there is no way that enough electricity would be generate to power any device.

The examiner strongly disagrees with Applicant's statement on page 12 that "the cell is expected to generate a potential between the electrodes even without a catalyst

..." Even if the splitting takes place on either side of the membrane, the hydrogen and oxygen molecule would have to split at the same time and in an area close enough to the membrane that the potential would drive the hydrogen ions to the oxygen ions, and the electron across the load. But a mere cloud of hydrogen molecules would not necessarily produce the few hydrogen ions suggested by Applicant in the location necessary to drive the reaction. The catalyst is necessary to drive the reaction.

If Applicant still feels strongly that the fuel cell reaction can proceed without a catalyst, Applicant is invited to provide proof. However, the examiner holds that the catalyst in fuel cell reactions does not merely speed the reaction but drives it, and that one of ordinary skill in the fuel cell art knows that the catalyst is necessary in order for the fuel cell reaction to take place.

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As for the 102 rejection, Applicant argues that the adhesive of Pratt et al. is not necessarily conductive. Yet, the examiner hold that the adhesive must be conductive otherwise the current collector would be unable to collect the current and the battery would short.

Conclusion

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16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is (571)272-1101. The examiner can normally be reached on Mon-Fri 8-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy N. Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795

Alix Elizabeth Echelmeyer
Examiner
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aee

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